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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No.	:	09/837,937
Appellant(s)	:	HOELEN, Christoph G. A.
Filed	:	19 April 2001
Title	:	ASSEMBLY OF A DISPLAY DEVICE AND AN ILLUMINATION SYSTEM
TC/A.U.	:	2675
Examiner	:	ANYASO, Uchendu O.
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APPELLANT'S APPEAL BRIEF

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BRIEF OF APPELLANT

This Brief of Appellant follows a Notice of Appeal, dated 2 June 2004, appealing the decision dated 10 March 2004, of the Examiner finally rejecting claims 1-20 of the application. All requisite fees set forth in 37 CFR 1.17(c) for this Brief are hereby authorized to be charged to Deposit Account No. 501850.

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REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee of all rights in and to the subject application, Koninklijke Philips Electronics, N.V. of The Netherlands.

RELATED APPEALS AND INTERFERENCES

To the best of the knowledge of the undersigned, no other appeals or interferences are known to Appellants, Appellants' legal representatives, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1-9 were presented in the subject Application as originally filed. Claims 1-9 were amended and claims 10-20 were added by amendment in the response dated 17 March 2003. Claims 1-20 were amended in the response dated 21 July 2003, and the amendment was subsequently entered by effect of the RCE dated 4 September 2003. Claims 1, 8, 9, 17 and 19 were again amended in the response dated 24 December 2003. Claims 1-20 stand finally rejected as set forth in the Final Office Action dated 10 March 2004, and are the subject of this appeal.

STATUS OF AMENDMENTS

No amendment to the specification and/or claims was offered subsequent to the Final Office action. All amendments have been entered.

SUMMARY OF THE CLAIMED SUBJECT MATTER

The invention relates to an assembly comprising: a display device provided with a pattern of pixels driven by a control circuit; and an illumination system for illuminating the display device, said illumination system comprising a light-emitting panel and at least one light source, said light source being associated with the light-emitting panel. The invention further relates to a display device and to an illumination system for use in said assembly. (page 1, lines 1-7 of Appellant's specification)

In accordance with the invention, such an assembly is characterized in that the light source comprises at least three sets of light-emitting diodes having different light-emission wavelengths, and in that the control circuit also drives the luminous fluxes of the light-emitting diodes in dependence upon an image to be displayed by the display device. (page 2, lines 26-30; page 4, lines 27, 28; page 6, lines 23-25; claim 1)

By applying LEDs having different light-emission wavelengths and controlling the relative intensities of the LEDs of different colors, the color point of an image to be displayed by the display device can be adjusted without controlling the transmission factors of the pixels of the display device. In other words, changing the color point of an image displayed by the display device is controlled by the illumination system, not by the display device. If a substantial contribution of the display device is required to control the color point of the image to be displayed, then the contrast of the image displayed is reduced. (page 2, line 31 – page 3, line 3 of the specification)

The inventors have recognized that by suitably unlinking the functions of the illumination system and the display device in the assembly, an increase of the contrast of the image displayed by the display device is achieved. If the color point of the image displayed by the display device is controlled mainly by the illumination system, then the transmission factors of the pixels of the display device can be optimally used to display a high-contrast image. (page 3, lines 4-9 of the specification)

A preferred embodiment of the assembly in accordance with the invention is characterized in that the control circuit varies the intensities of the light emitted by the light-emitting diodes in response to the illumination level of the image to be displayed by the display device. (page 3, lines 19-22 of the specification; claim 2)

A particularly favorable embodiment of the assembly in accordance with the invention is characterized in that the intensities of the light emitted by the light-emitting diodes can be adjusted on a frame-to-frame basis. The luminous fluxes of the LEDs can be adjusted sufficiently rapidly to supply the desired light intensity from frame to frame. LEDs can be dimmed without an appreciable loss of light output. (page 4, lines 13-17 of the specification; claims 3 and 12)

An alternative, favorable embodiment of the assembly in accordance with the invention is characterized in that the intensities of the light emitted by the light-emitting diodes can be adjusted for each color on a frame-to-frame basis. The luminous flux of each of the LEDs of a different color can be adjusted sufficiently rapidly to supply the desired light intensities from frame to frame. An advantage of the adjustability of the LEDs for each color resides in that a (set of) video frames can be provided with a "punch" or "boost" of a certain color. This means that the light intensity of one type of the colored LEDs is temporarily operated in the "overdrive" mode. The luminous flux through the other types of colored LEDs can be simultaneously reduced, or even switched off, at will. (page 4, lines 18-26; claims 4 and 13)

In an alternative embodiment, the light source comprises four LEDs of different colors, i.e. a combination of red, green, blue and amber LEDs. Combinations of said three or more LEDs of different colors enable large areas to be encompassed in the 1931 C.I.E. color triangle known to those skilled in the art. A suitable choice of the color co-ordinates of the LEDs and of the ratio between the various colors enables the illumination system to generate light having a great variety of color temperatures and color points. For example, given the desired color temperature of

the light coupled out by the light-emitting panel, the color point of the light can be chosen to be on the black body locus. A color point on the black body locus is alternatively referred to as the "white point" (at the given color temperature). (page 4, line 29-page 5, line 4; claims 5, 14, 18 and 20)

Preferably, each of the light-emitting diodes has a luminous flux of at least 5 lm. LEDs having such a high output are alternatively referred to as LED power packages. The application of these high-efficiency, high-output LEDs has the specific advantage that the number of LEDs can be comparatively small at a desired, comparatively high light output. This has a favorable effect on the compactness and the efficiency of the illumination system to be manufactured. Further advantages of the use of LEDs are: a comparatively very long service life, comparatively low energy costs and comparatively low maintenance costs of an illumination system comprising LEDs. The use of LEDs yields dynamic illumination possibilities. (page 5, lines 5-13 of the specification; claims 6 and 15)

Preferably, the LEDs 16, 16', 16" are mounted on a (metal-core) printed circuit board. If power LEDs are provided on such a (metal-core) printed circuit board (PCB), the heat generated by the LEDs can be readily dissipated by means of heat conduction via the PCB. (page 7, lines 14-17; claims 7 and 16)

The invention further relates to a display device and to an illumination system for use in said assembly. (page 1, lines 6, 7 of the specification; claims 8, 9, 17, 19)

Preferably, the light source comprises at least three light-emitting diodes having different light-emission wavelengths. Particularly suitable is a combination of red, green and blue LEDs, which is known per se. (page 4, lines 27-29; claims 10 and 11)

GROUND(S) OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are:

1. Are claims 1, 2, 5, 6, 8-11, 14, 15 and 17-20 unpatentable under 35 USC 103(a) over Nobs (U.S. patent 4,559,480) in view of Havel (U.S. patent 6,535,186)?
2. Are claims 7 and 16 unpatentable under 35 USC 103(a) over Nobs in view of Havel and in further view of Streck (U.S. patent 5,278,545)?
3. Are claims 3, 4, 12 and 13 unpatentable under 35 USC 103(a) over Nobs in view of Havel and in further view of Gibbons (U.S. patent 5,122,791)?

ARGUMENT

1. Are claims 1, 2, 5, 6, 8-11, 14, 15 and 17-20 unpatentable under 35 USC 103(a) over Nobs (U.S. patent 4,559,480) in view of Havel (U.S. patent 6,535,186)?

Claims 1, 2, 5, 6, 8-11, 14, 15 and 17-20 are rejected under 35 USC 103(a) over Nobs in view of Havel.

Nobs discloses a light emitting element for use in a matrix display board (col. 1, lines 7, 8). According to his invention, the incandescent lamp light emitting element of the prior art is replaced by a fluorescent tube, which is more energy-efficient, has longer life, diminished heat output and fixed color temperature (col. 2, lines 30-40).

Nobs' display board may be monochrome or color. A pixel for colored light having three fluorescent tubes of different colors (red, green and blue) is shown for example in Figure 3. In the alternative, three white tubes with different color filters may be provided (col. 4, lines 17-22). Colors across a broad spectrum may be obtained by independently varying the intensities of the light emitted by each of the tubes (col. 4, lines 28-31).

Nobs does not teach or suggest a separate illumination source to illuminate the display. All illumination is provided by the light emitting elements of the display board itself.

Havel discloses a multicolor display element including a plurality of display areas or segments. Each segment includes light emitting diodes of different colors (col. 2, lines 56-60). According to his invention, a gate network is provided for blending the primary colors (col. 2, lines 65-67).

Like Nobs, Havel does not teach or suggest a separate illumination source to illuminate the display. All illumination is provided by the light emitting diodes of the display segments.

In contrast to both Nobs and Havel, Appellant claims an assembly of a display device and a separate illumination system for providing illumination to the display device. Such illumination is coupled to the display device via a light-emitting panel. See, for example, claim 1.

Since Nobs and Havel, whether each is considered alone, or both are considered in combination, fail to teach or suggest a separate illumination system for a display device, the Examiner has failed to establish a prima facie case of obviousness under Section 103(a).

In the Advisory Action dated 20 May 2004, the Examiner argued that the display segments with the light emitting diodes constitute the illumination system which provides illumination to the display. However, the display segments are an integral part of the display device itself, and thus cannot constitute an illumination system separate from the display device.

For example, in Fig. 1, Havel shows a two-color seven-segment display element 42. Each display segment includes a pair of LEDs. (col. 3, lines 26-32). Thus, unlike Nobs, in which the light-emitting elements of the display board include fluorescent tubes, the light-emitting display segments of Havel include light emitting diodes. However, in both cases, illumination is provided by the display itself, not by a separate illumination system.

Moreover, even if Nobs and Havel could somehow be argued to teach or suggest a separate illumination system, they would still fail to render Appellant's invention unpatentable, since Appellant's invention also calls for a control circuit which not only drives the pixels of the display device, but also drives the luminous fluxes of the LEDs in dependence upon an image to be displayed by the display device. See, for example, claim 1.

Accordingly, it is urged that the rejection of claims 1, 2, 5, 6, 8-11, 14, 15 and 17-20 under 35 USC 103(a) over Nobs in view of Havel is in error, and should be reversed.

2. Are claims 7 and 16 unpatentable under 35 USC 103(a) over Nobs in view of Havel and in further view of Streck (U.S. patent 5,278,545)?

Claims 7 and 16 stand rejected under 35 USC 103(a) as unpatentable over Nobs in view of Havel and in further view of Streck.

Streck discloses a backlit LCD display panel in which a plurality of LEDs is formed on a printed circuit board (col. 3, lines 44-47). However, Streck fails to teach or suggest that the plurality of LEDs is composed of sets of LEDs having different light-emitting wavelengths, as called for by claims 7 and 16.

Accordingly, it is urged that the rejection of claims 7 and 16 under 35 USC 103(a) over Nobs in view of Havel and in further view of Streck is in error, and should be reversed.

3. Are claims 3, 4, 12 and 13 unpatentable under 35 USC 103(a) over Nobs in view of Havel and in further view of Gibbons (U.S. patent 5,122,791)?

Claims 3, 4, 12 and 13 stand rejected under 35 USC 103(a) as being unpatentable over Nobs in view of Havel and in further view of Gibbons.

Gibbons discloses a display device having a lattice of liquid crystal display elements, each element selectively settable between two states, one allowing the transmission of light and the other state not allowing any transmission, and control

means for setting the states of the elements according to a display signal (col. 1, lines 15-21). Also provided is a light source. For a color display, the light source can be a lattice of three groups of three display elements (e.g., fluorescent tubes) producing different colors (col. 2, lines 19-22). Control means for the light source varies the intensity of each color in accordance with display information (col. 1, lines 28-31; col. 3, lines 54, 55).

Thus, Gibbons provides a first control means for setting the display elements to either an 'on' or 'off' state, and a second control means to provide light intensities of different colors in accordance with a display signal.

In an exemplary embodiment, all of the display elements are set to their 'on' or 'off' state before the fluorescent tubes are activated (col. 3, lines 58-62).

In contrast, Appellant's assembly provides a single control circuit which both drives the display device and the luminous fluxes of the LEDs of the light source in dependence upon the display image. See, for example, claim 1.

In an exemplary embodiment of Appellant's invention, the control circuit includes an LCD driver, an LED driver and a driver interface for exchanging information between the two drivers (see page 12, lines 5-9 of Appellant's specification).

Since Nobs and Havel fail to teach or suggest a separate illumination system, and Gibbons fails to teach or suggest the use of a control circuit to control both the display device and the illumination system in dependence upon the display image, the combination of these three references fails to render Appellant's claims unpatentable.

Accordingly, it is urged that the rejection of claims 3, 4, 12 and 13 under 35 USC 103(a) over Nobs in view of Havel and in further view of Gibbons is in error, and should be reversed.

CONCLUSION

In view of the foregoing, Appellant respectfully requests that the Board reverse the rejection of record, and direct the Examiner to allow all of the pending claims, and to otherwise find the application to be in condition for allowance.

Respectfully submitted,

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APPENDIX

CLAIMS ON APPEAL

1. An assembly comprising:

a display device provided with a pattern of pixels driven by a control circuit, and

an illumination system for illuminating the display device, said illumination system comprising a light-emitting panel and at least one light source, said light source being associated with the light-emitting panel, the light-emitting panel capable of providing light to the display device, wherein:

the light source comprises at least three sets of light-emitting diodes, wherein each set of light-emitting diodes has a different light-emission wavelength, and

the control circuit also drives luminous fluxes of the light-emitting diodes in dependence upon an image to be displayed by the display device.

2. An assembly as claimed in claim 1, wherein the control circuit varies an intensity of light emitted by each set of the light-emitting diodes in response to an illumination level of the image to be displayed by the display device.

3. An assembly as claimed in claim 1, wherein the intensity of the light emitted by each set of the light-emitting diodes can be adjusted on a frame-to-frame basis.

4. An assembly as claimed in claim 1, wherein the intensity of the light emitted by each set of the light-emitting diodes can be adjusted for each color on a frame-to-frame basis.

5. An assembly as claimed in claim 1, wherein the light source comprises

at least four sets of light-emitting diodes, wherein each set of light-emitting diodes has a different light-emission wavelength.

6. An assembly as claimed in claim 1, wherein each diode in each set of the light-emitting diodes has a luminous flux of at least five lumens (5 lm).

7. An assembly as claimed in claim 6, wherein each set of the light-emitting diodes is mounted on a printed circuit board.

8. A display device for use with an illumination system, the illumination system comprising a light-emitting panel and at least one light source, the light source being associated with the light-emitting panel and comprising at least three sets of light-emitting diodes, each set of light-emitting diodes having a different light-emission wavelength, the display device comprising:

a pattern of pixels capable of receiving light from the light-emitting panel in the illumination system; and

a control circuit operable to drive the pixels, the control circuit also operable to drive luminous fluxes of the light-emitting diodes in dependence upon an image to be displayed by the display device.

9. An illumination system for use with a display device, the display device provided with a pattern of pixels driven by a control circuit, the illumination system for illuminating the display device and comprising:

a light-emitting panel; and

at least one light source associated with the light-emitting panel;

wherein the light source comprises at least three sets of light-emitting diodes, each set of light-emitting diodes having a different light-emission wavelength, the light-emitting panel capable of providing light to the display device; and

wherein the control circuit is operable to drive luminous fluxes of the light-

emitting diodes in dependence upon an image to be displayed by the display device.

10. An assembly as claimed in claim 1, wherein a first set of light-emitting diodes has a red light-emission wavelength, a second set of light-emitting diodes has a green light-emission wavelength, and a third set of light-emitting diodes has a blue light-emission wavelength.

11. An assembly as claimed in claim 2, wherein a first set of light-emitting diodes has a red light-emission wavelength, a second set of light-emitting diodes has a green light-emission wavelength, and a third set of light-emitting diodes has a blue light-emission wavelength.

12. An assembly as claimed in claim 2, wherein the intensity of light emitted by each set of the light-emitting diodes can be adjusted on a frame-to-frame basis.

13. An assembly as claimed in claim 2, wherein the intensity of light emitted by each set of the light-emitting diodes can be adjusted for each color on a frame-to-frame basis.

14. An assembly as claimed in claim 5, wherein a first set of light-emitting diodes has a red light-emission wavelength, a second set of light-emitting diodes has a green light-emission wavelength, a third set of light-emitting diodes has a blue light-emission wavelength, and a fourth set of light-emitting diodes has an amber light-emission wavelength.

15. An assembly as claimed in claim 2, wherein each diode in each set of the light-emitting diodes has a luminous flux of at least five lumens (5 lm).

16. An assembly as claimed in claim 15, wherein each set of the light-

emitting diodes is mounted on a printed circuit board.

17. A display device for use with an illumination system, the illumination system comprising a light-emitting panel and at least one light source, the light source being associated with the light-emitting panel and comprising at least three sets of light-emitting diodes, each set of light-emitting diodes having a different light-emission wavelength, the display device comprising:

a pattern of pixels capable of receiving light from the light-emitting panel of the illumination system; and

a control circuit operable to drive the pixels, the control circuit also operable to drive luminous fluxes of the light-emitting diodes in dependence upon an image to be displayed by the display device;

wherein the control circuit is operable to vary an intensity of light emitted by each set of the light-emitting diodes in response to an illumination level of the image to be displayed by the display device.

18. A display device as claimed in claim 17 wherein the light source comprises at least four sets of light-emitting diodes, wherein each set of light-emitting diodes has a different light-emission wavelength.

19. An illumination system for use with a display device, the display device provided with a pattern of pixels driven by a control circuit, the illumination system for illuminating the display device and comprising:

a light-emitting panel; and

at least one light source associated with the light-emitting panel;

wherein the light source comprises at least three sets of light-emitting diodes, each set of light-emitting diodes having a different light-emission wavelength, the light-emitting panel capable of providing light to the display device;

wherein the control circuit is operable to drive luminous fluxes of the light-

emitting diodes in dependence upon an image to be displayed by the display device; and

wherein the control circuit is further operable to vary an intensity of light emitted by each set of the light-emitting diodes in response to an illumination level of the image to be displayed by the display device.

20. An illumination system as claimed in claim 19 wherein the light source comprises at least four sets of light-emitting diodes, wherein each set of light-emitting diodes has a different light-emission wavelength.